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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/555,179	10/31/2005	Peng Wang	ECPO-3	2643
53450 7590 08/02/2010 KRIEG DEVAULT LLP ONE INDIANA SQUARE SUITE 2800 INDIANAPOLIS, IN 46204-2079			EXAMINER DAM, DUSTIN Q	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 08/02/2010	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/555,179

Applicant(s)

WANG ET AL.

Examiner

DUSTIN Q. DAM

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2010.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
4a) Of the above claim(s) 5, 7, 8 and 16-20 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-4, 6, 9-15 and 21-29 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/06)
Paper No(s)/Mail Date 4/21/2006 & 10/31/2005
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Species B(1) and Species C(1-2) in the reply filed on April 8, 2010 is acknowledged. Applicant traverses the restriction of Species B(1) on pages 4-5 of the response filed November 2, 2010 and alleges "the groups of claim 6 actually share the common characteristic of being neutral molecules and uncharged groups. Said common characteristic of the specific neutral terminal group therefore renders these groups patentably indistinct..." These arguments are not persuasive because the standard for proper species restriction is not limited to sharing common characteristics. The groups of claim 6, as previously elaborated in the restriction requirement, are mutually exclusive and are not obvious variants. Sharing common characteristics do not render species patentably indistinct; especially since all species of the same genus share common characteristics of the genus. Applicant traverses the restriction of Species C(1-2) on page 5 of the response filed November 2, 2010 and alleges the 27 restricted formulas of claim 10 share common characteristics. Again, sharing common characteristics does not render mutually exclusive and non-obvious variants patentably indistinct. Applicant does, however, admit formula (1) and formula (2) of claim 10 are obvious variants (see response filed November 2, 2010, page 5). Consequentially, formula (2) of claim 10 will be examined along with elected formula (1) as the record now indicates Species (C1) and Species (C2) as obvious variants.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 1-29 are currently pending while claims 5, 7, 8, and 16-20 have been withdrawn from consideration. Claims 1-4, 6, 9-15, and 21-29 have been fully considered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 2 recites the broad recitation "between 10 and ½", and the claim also recites "in particular of between 5 and 1" which is the narrower statement of the range/limitation.

5. Claim 28 recites the limitation "said polymer" on line 1. There is insufficient antecedent basis for this limitation in the claim.

6. Claims 13-15 recite the limitation "said sensitizing dye" on line 1-2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-4, 6, 9, 11, and 21-27 are rejected under 35 U.S.C. 102(a) and 35 U.S.C. 102(c) as being anticipated by CHITTIBABU et al. (U.S. PG-Pub 2004/0025934 A1).

a. With regards to claim 1, CHITTIBABU et al. discloses a regenerative photochemical cell comprising a photoanode (layer 603 directly on bottom layer 618, FIG. 6; both in combination are interpreted to read on the claimed photoanode), said photoanode comprising at least one semi-conductive metal oxide layer (603, FIG. 6; see [0047] describing layer 603 as a "photosensitized interconnected nanoparticle material" which [0042] describes may comprise "TiO₂" which is interpreted to include a "semi-conductive metal oxide layer") on a conductive substrate (as depicted in FIG. 6 on conductive substrate layer 618; see [0047] describing element 618 as "electrical

conductor 618” which is interpreted to include a “conductive substrate” because electrical conductor 618 is an under-layer supporting layer 603), sensitized by a photosensitizer dye ([0051] discloses “photosensitizing agents” which may be a “dye” and may be “sorbed on the surfaces of the interconnected nanoparticles 603”), a counter electrode (top 618 layer, FIG. 6 directly contacting layer 615; see [0047] describing element 618 as “electrical conductor 618 deposited on one or both of the substrates” which the top most 618 layer is interpreted to read on the claimed “counter electrode”) and an electrolyte (see [0047] describing charge carrier 606; see [0054] describing charge carrier material 606 may be a “polymeric electrolyte” which is interpreted to read on the claimed “electrolyte”) arranged between said semi-conductive metal oxide layer and said counter electrode (see FIG. 6 depicting charge carrier layer 606 between the semi-conductive metal oxide comprised layer 603 and counter electrode top 618 layer), characterized in that an amphiphilic compacting compound (such as compound 1330 described in [0100] which is interpreted to include a amphiphilic compound) whose molecular structure inherently comprises at least one anchoring group, a hydrophobic portion and a terminal group (the cited structure 1330 described in [0100] is interpreted to inherently comprise an anchoring group, terminal group, and hydrophobic portion because the compound is described in [0097] as “co-absorbed along with sensitizing dyes on the surface of...titania”; additionally, [0099-0100] explains the co-sensitizer may be absorbed via specific coordinating/chelating groups) is co-absorbed with said photosensitizing dye on said semi-conductive metal oxide layer in a mixed monolayer ([0097] discloses the co-sensitizer and dye to be “co-absorbed along with sensitizing dyes on the surface

of...titania" which is interpreted to provide a "mixed monolayer", or a single layer of mixed dye/co-sensitizer, on the titania).

b. With regards to claim 2, CHITTIBABU et al. discloses a cell characterized in that said photosensitizing dye and said compacting compound form a self-assembled mixed monolayer on said semi-conductive metal oxide layer ([0097] discloses the co-sensitizer and dye to be "co-absorbed along with sensitizing dyes on the surface of...titania" and [0102] describes overnight soaking of the dye and co-sensitizer which is interpreted to provide the resultant structure of a "self-assembled mixed monolayer" on the titania), wherein the molar ratio of said photosensitizing dye to said co-absorbed compacting compound is of between 5 and 1 (such as a ratio of about 2, or about 50% mol co-sensitizer per mole of dye described in [0098]).

c. With regards to claim 3, CHITTIBABU et al. discloses a cell characterized in that said self-assembled monolayer is a dense packed monolayer having an order-disorder transition temperature above 80°C ([0100] describes co-sensitizer 1330 and [0098] discloses a range of ratios of the dye to co-sensitizer which is interpreted inherently provide an order-disorder transition temperature above 80°C).

d. With regards to claim 4, CHITTIBABU et al. discloses a cell characterized in that said anchoring group of said compacting compound is COOH ([0100] "A may be a carboxylic acid group or derivative thereof" which is interpreted to read on the claimed "COOH").

- e. With regards to claim 6, CHITTIBABU et al. discloses a cell characterized in that said terminal group of the compacting compound is a neutral alkyl group ([0100] “alkyl”).
- f. With regards to claim 9, CHITTIBABU et al. discloses a cell characterized in that the length of said hydrophobic chain portion of the compacting compound allows said terminal group to protrude above the sensitizing dye in said monolayer ([0097] discloses the co-sensitizer and dye to be “co-absorbed along with sensitizing dyes on the surface of...titania”; since the titania layer, such as depicted in FIG. 5A-B, is interpreted to be non-planar, the dye and co-sensitizer absorbed on the surface of the titania is interpreted to provide for some degree of the terminal end of the co-sensitizer to protrude above the dye).
- g. With regards to claim 11, CHITTIBABU et al. discloses a cell characterized in that said compacting compound is an alkyl carboxylic acid ([0100] discloses structure 1330 may comprise contain “carboxylic acid group” and “alkyl...group” which is interpreted to be included as an alkyl carboxylic acid).
- h. With regards to claim 21, CHITTIBABU et al. discloses a cell characterized in that said electrolyte comprises a redox system and said redox system comprises an electrochemically active salt and a first compound forming a redox couple with either the anion or the cation of said electrochemically active salt ([0053] “lithium iodide/iodine”).
- i. With regards to claim 22, CHITTIBABU et al. discloses a cell characterized in that said electrolyte comprises a room temperature molten salt, said molten salt being a liquid at least between standard room temperature and 80°C above said room temperature

([0072] “Iodide based molten salts, e.g., methylpropylimidazolium iodide, methylbutylimidazolium iodide, methlhexylimidazolium iodide, etc.” which are interpreted to inherently be liquid at least between standard room temperature and 80°C above said room temperature).

j. With regards to claims 23 CHITTIBABU et al. discloses a cell characterized in that said electrolyte further comprises a polar organic solvent having a boiling point of 100°C or greater than 100°C at normal atmospheric pressure ([0089] discloses addition of “t-butylpyridine based passivation agent” which [0088] discloses the agent may comprise “methoxypropionitrile”; the passivation agent is interpreted to read on the claimed organic solvent inherently comprising the claimed boiling point).

k. With regards to claim 24, CHITTIBABU et al. discloses a cell characterized in that said solvent is 3-methoxypropionitrile ([0089] discloses addition of “t-butylpyridine based passivation agent” which [0088] discloses the agent may comprise “methoxypropionitrile”; the passivation agent used specifically in EXAMPLE 14 disclosed in [0088-0089] which comprises “methoxypropionitrile” is interpreted to exist in a 3-methoxypropionitrile position).

l. With regards to claims 25 and 26, CHITTIBABU et al. discloses a cell characterized in that said electrolyte further comprises an additive of a neutral molecule characterized in that the molecule has the formula of claim 26 ([0089] discloses “methylbenzimidazole”).

m. With regards to claim 27, CHITTIBABU et al. discloses a cell characterized in that said electrolyte comprises an effective gelifying amount of gelifying compound

([0072-0073] describes "Gel Electrolytes" which is gelled by lithium metal ions and a complexing agent which "can be used to gel a suitable electrolyte solution" which is interpreted to be an "effective amount").

9. Claims 1 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by HIROO (EP 1052661 A2).

a. With regards to claim 1, HIROO discloses a regenerative photochemical cell comprising a photoanode (10 & 20, FIG. 1 as described in [0071]), said photoanode comprising at least one semi-conductive metal oxide layer (layer 20, FIG. 1 described in [0071] as a "photosensitive layer 20" which [0084] describes can comprise the metal oxide semi-conductive material "TiO₂" which is interpreted to provide for the claimed "semi-conductive metal oxide layer") on a conductive substrate (10, FIG. 1; see [0071] describing layer 10 as "electrically conductive layer 10"), sensitized by a photosensitizer dye ([0071] discloses layer 20 may be "sensitized by a metal complex dye 22"), a counter electrode (40, FIG. 1) and an electrolyte ([0071] describes layer 30, FIG. 1 as a "charge transfer layer" and [0108] discloses the charge transfer material may be an "electrolyte") arranged between said semi-conductive metal oxide layer and said counter electrode (as depicting in FIG. 1), characterized in that an amphiphilic compacting compound whose molecular structure inherently comprises at least one anchoring group, a hydrophobic portion and a terminal group is co-absorbed with said photosensitizing dye on said semi-conductive metal oxide layer in a mixed monolayer (HIROO discloses on page 47, the multi dye complex "D-1"; the Ru metal dye directly attached to ligand LL₁ is interpreted to read on the claimed "photosensitizer dye" and the Ru metal dye directly attached to

ligand LL₂ is interpreted to read on the claimed "compacting compound" inherently comprising an anchoring group to the first metal dye, hydrophobic portion, and terminal group; "monolayer" is interpreted to include a single, or mono, layer; layer 20, FIG. 1 which includes the photosensitizer dye and compacting compound is interpreted to read on the claimed "monolayer" because it is disclosed in [0089] as a singular "Semiconductor particle layer").

b. With regards to claim 9, HIROO discloses a cell characterized in that the length of said hydrophobic chain portion of the compacting compound allows said terminal group to protrude above the sensitizing dye in the monolayer (HIROO discloses on page 47, the multi dye complex "D-1"; the Ru metal dye directly attached to ligand LL₁ is interpreted to read on the claimed "photosensitizer dye" and the Ru metal dye directly attached to ligand LL₂ is interpreted to read on the claimed "compacting compound" inherently comprising an anchoring group to the first metal dye, hydrophobic portion, and terminal group; [0065] discloses the interlocking group of each multi dye complex may be "LL₁" which in dye "D-1" would provide for the terminal portion of the compacting compound to protrude above the photosensitizing dye).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 3, 10, 12, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over CHITTIBABU et al. (U.S. PG-Pub 2004/0025934 A1).

- a. With regards to claim 3, independent claim 1 and dependent claim 3 are anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a photochemical cell comprising a dense packed monolayer of a co-sensitizer and dye ([0098] discloses relative molar concentrations of the dye to sensitizer in the monolayer, and [0100] and [0051] describes specific dyes).

CHITTIBABU et al. appears to inherently disclose a dense packed monolayer having an order-disorder transition temperature above 80°C.

However, upon contrary support that the ratios of dye to co-sensitizer does not provide an order-disorder temperature in the claimed range, it would have been obvious to a person skilled in the art to have optimized the ratio of dye to co-sensitizer in the monolayer and arrived at the claimed range for order-disorder temperature through routine experimentation (See MPEP 2144.05); especially since CHITTIBABU et al. contemplates different ratios for dye and co-sensitizer ([0098]).

b. With regards to claims 23 and 24, independent claim 1 is anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a cell comprising an electrolyte containing methoxypropionitrile ([0089] discloses addition of “t-butylpyridine based passivation agent” which [0088] discloses the agent may comprise “methoxypropionitrile”; the passivation agent is interpreted to read on the claimed organic solvent).

CHITTIBABU et al. does not explicitly appear to disclose the methoxypropionitrile solvent to be attached at the 3rd position to provide for 3-methoxypropionitrile.

However, the 3rd attachment position is one in a finite number of attachment positions available for methoxypropionitrile.

Thus, at the time of the invention, it would have been obvious to a person having ordinary skill in the art to have tried attaching the methoxypropionitrile at the 3rd position which would provide for 3-methoxypropionitrile because the 3rd position is one in a finite number of options within the technical grasp of a skilled artisan that would provide for reasonable expectation of success based on the known properties of the known substance 3-methoxypropionitrile (See MPEP 2141 {III} {E}). Modified CHITTIBABU et al. is interpreted to inherently provide a solvent with a boiling point in the claimed range as 3-methoxypropionitrile is the same compound claimed by applicant in claim 24.

c. With regards to claim 10, independent claim 1 is anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a photochemical cell comprising a compacting compound referred to as a co-sensitizer.

CHITTIBABU et al. discloses the compacting compound may have a "carboxylic acid group or derivative thereof" or "phosphate group" (see [0100]).

CHITTIBABU et al. does not appear to explicitly disclose the specific phosphate group having the formula (1) or (2) of claim 10.

However, decylphosphonic acid is a known compound in the phosphate group.

Thus, absent contrary support for an unexpected result, it would have been obvious to a person having ordinary skill in the art to have tried decylphosphonic acid as the phosphate group in the cell of CHITTIBABU et al. because decylphosphonic acid is one in a finite number of phosphate groups within the technical grasp of a skilled artisan which, looking at the disclosure of CHITTIBABU et al. contemplating using phosphate groups, would have reasonably expected similar results (See MPEP 2141 {III} {E}). The examiner welcomes a showing of unexpected results.

d. With regards to claim 12, independent claim 1 is anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a photochemical cell comprising a compacting compound referred to as a co-sensitizer. CHITTIBABU et al. discloses the compacting compound may have a "carboxylic acid group or derivative thereof" or "phosphate group" (see [0100]).

CHITTIBABU et al. does not appear to explicitly disclose the specific carboxylic acid group such as cyclohexane-carboxylic acid.

However, cyclohexane-carboxylic acid is a known acid in the carboxylic acid group.

Thus, absent contrary support for an unexpected result, it would have been obvious to a person having ordinary skill in the art to have tried cyclohexane-carboxylic acid as the carboxylic acid in the cell of CHITTIBABU et al. because cyclohexane-carboxylic acid is one in a finite number of carboxylic acids within the technical grasp of a skilled artisan which, looking at the disclosure of CHITTIBABU et al. contemplating using carboxylic acids, would have reasonably expected similar results (See MPEP 2141 {III} {E}). The examiner welcomes a showing of unexpected results.

13. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over CHITTIBABU et al. (U.S. PG-Pub 2004/0025934 A1) in view of SIGMA-ADRIK (MSDS for “*cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-dinonyl-2'-bipyridyl)ruthenium(II) 4/7/2009).

a. With regards to claims 13-15, independent claim 1 is anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a photochemical cell comprising a photosensitizer dye. CHITTIBABU et al. discloses the photosensitizer dyes may be various isothiocyanato ruthenium type dyes with 2,2'-bipyridyl-4,4'-dicarboxylato type ligands ([0051]).

CHITTIBABU et al. does not appear to explicitly disclose a cell characterized in that said photosensitizer dye is *cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-dinonyl-2'-bipyridyl)ruthenium(II).

However, *cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-dinonyl-2'-bipyridyl)ruthenium(II) is one in a finite number of isothiocyanato ruthenium type complexes with 2,2'-bipyridyl-4,4'-dicarboxylato type ligands which was on sale in

the United States prior to the filing date of the instant application, sold by SIGMA ALDRICH as made evident by the MSDS for "*cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-di-nonyl-2'-bipyridyl)ruthenium(II).

Thus, at the time of the invention, it would have been obvious to a person having ordinary skill in the art to have tried *cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-di-nonyl-2'-bipyridyl)ruthenium(II) as the photosensitizer dye in the cell of CHITTIBABU et al. because *cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-di-nonyl-2'-bipyridyl)ruthenium(II) is one in a finite number of isothiocyanato ruthenium type complexes with 2,2'-bipyridyl-4,4'-dicarboxylato type ligands which is within the technical grasp of a skilled artisan which would provide for reasonable expectation of success (see MPEP 2141 {III} {E}). It would have also been obvious at the time of the invention to a person having ordinary skill in the art to have substituted the *cis*-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-di-nonyl-2'-bipyridyl)ruthenium(II) complex sold by SIGMA ALDRICH for the photosensitizer dye in the cell of CHITTIBABU et al. because the simple substitution of a known element known in the art, in the instant case a known isothiocyanato ruthenium type complex with 2,2'-bipyridyl-4,4'-dicarboxylato type ligands, is a matter of obviousness (see MPEP 2141 {III} {B}).

14. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over CHITTIBABU et al. (U.S. PG-Pub 2004/0025934 A1) in view of GREEN et al. (U.S. Patent 6,245,847 B1).

a. Independent claim 1 is anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a photochemical cell

comprising an electrolyte containing a molten salt ([0072] “Iodide based molten salts, e.g., methylpropylimidazolium iodide, methylbutylimidazolium iodide, methlhexylimidazolium iodide, etc.”).

CHITTIBABU et al. does not appear to explicitly disclose the molten salt being a liquid at least between standard room temperature and 80°C above said room temperature.

However, GREEN et al. discloses molten salts in electrolytes which GREEN et al. discloses the molten salt to be liquid at a temperature range from room temperature to 80°C (line 36-38, column 1).

Thus, at the time of the invention, it would have been obvious to a person having ordinary skill in the art to have substituted the molten salt of CHITTIBABU et al. with the molten salt of GREEN et al., which is liquid between room temperature and 80°C, because the simple substitution of a known element known in the art to perform the same function, in the instant case a molten salt in an electrolyte system, is a matter of obviousness (See MPEP 2141 {III} {B}).

15. Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over CHITTIBABU et al. (U.S. PG-Pub 2004/0025934 A1) in view of MISRA et al. (U.S. PG-Pub 2004/0115524 A1).

a. With regards to claims 27-29, independent claim 1 and dependent claim 21 are anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above. CHITTIBABU et al. discloses a photochemical cell comprising a redox system electrolyte.

CHITTIBABU et al. does not appear to explicitly disclose an electrolyte comprising the claimed gelifying compound in the claimed range between 2% and 50% by weight of the electrolyte.

However, MISRA et al. discloses an electrolyte and discloses a copolymer of PVdF-HFP may be added into an electrolyte to vary the viscosity of the electrolyte ([0042]). MISRA et al. also discloses an electrolyte comprising a redox system of salts and counter ions ([0040-0041]).

Thus, at the time of the invention, it would have been obvious to a person having ordinary skill in the art to have modified the electrolyte of CHITTIBABU et al. to include the copolymer of PVdF-HFP, as disclosed by MISRA et al. because it would provide for controlling viscosity of the electrolyte. It would have also been obvious to a person having ordinary skill in the art to have substituted the electrolyte in the cell of CHITTIBABU et al. with the electrolyte suggested by MISRA et al. because the simple substitution of a known element known in the art to perform the same function, in the instant case a redox system electrolyte in an electrochemical cell, is a matter of obviousness (See MPEP 2141 {III} {B}). It would have also been obvious at the time of the invention to a person having ordinary skill in the art to have optimized the amount of the copolymer of PVdF-HFP in the electrolyte and arrived at the claimed range through routine experimentation (See MPEP 2144.05); especially since it would lead to optimizing the viscosity of the electrolyte.

b. With regards to claims 28 and 29, independent claim 1 and dependent claim 27 are anticipated by CHITTIBABU et al. under 35 U.S.C. 102(a) as discussed above.

CHITTIBABU et al. discloses a photochemical cell comprising a redox system electrolyte comprising organic polymer complexing compounds for gelling the electrolyte ([0073-0074]).

CHITTIBABU et al. does not appear to explicitly disclose a cell wherein the complexing compound is specifically the claimed PVDF-HFP in the claimed range between 2% and 50% by weight of the electrolyte.

However, MISRA et al. discloses an electrolyte and discloses a copolymer of PVdF-HFP may be added into an electrolyte to vary the viscosity of the electrolyte ([0042]).

Thus, at the time of the invention, it would have been obvious to a person having ordinary skill in the art to have substituted the organic polymer complexing compound of CHITTIBABU et al. with the complexing compound of MISRA et al. because the simple substitution of a known element known in the art to perform the same function, in the instant case a complexing organic polymer for complexing/raising the viscosity of an electrolyte in an electrochemical cell, is a matter of obviousness (See MPEP 2141 {III} {B}). It would have also been obvious at the time of the invention to a person having ordinary skill in the art to have optimized the amount of the copolymer of PVdF-HFP in the electrolyte and arrived at the claimed range through routine experimentation (See MPEP 2144.05); especially since it would lead to optimizing the viscosity of the electrolyte.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DUSTIN Q. DAM whose telephone number is (571)270-5120. The examiner can normally be reached on Monday through Thursday, 6:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Michener can be reached on (571)272-1424. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Jennifer K. Michener/
Supervisory Patent Examiner, Art Unit 1795

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July 22, 2010

